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Journal of the Society of Arts.

FRIDAY, DECEMBER 7, 1855.

THIRD ORDINARY MEETING.

WEDNESDAY DECEMBER 5, 1855.

The Third Ordinary Meeting of the One Hundred and Second Session was held on Wednesday, the 5th inst., the Earl of Shelburne, M.P., in the chair.

The following candidates were balloted for and duly elected :—

Allen, Joshua Jullian	Lamb, Alfred
Anderson, John	Langworthy, Edw. Ryley
Atkinson, George Clayton	Lewis, Stephen
Bainbridge, Robert Walton	Lovelock, Samuel
Ball, Edward, M.P.	McGregor, James, M.P.
Bishop, John	McKellar, Andrew Duncan
Birkett, John	McMurray, William
Brand, George	Medlock, Henry
Brown, Joseph	Muncaster, Lord
Burnell, H. D. H.	Nind, Philip
Bury, John	Perry, John George
Carter, Bonham William	Pitman, John Talbot
Case, John March	Preston, Francis
Chance, Frank	Rawson, John
Clarke, Tanner Owen	Rees, Rowland
Clay, William	Reeves, John Bowles
Day, William	Richardson, Benjamin Ward
Dent, Wilkinson	Ricketts, Frederick
Dickson, Archibald	Roberts, Mrs. Elliot
Edwards, Rev. William	Roberts, Henry
Evershed, Samuel	Robinson, Restivo Edwin
Eyre, George Edward	Ross, Rev. A. J.
Foster, Edward, jun.	Rowney, Frederic
Franklinski, Joseph Alex.	Salt, Capt. Thomas
Gowar, Stephen	Sanderson, Charles
Gray, Jonathan	Savory, Thomas Haines
Green, Joseph Edwin	Smith, James
Hancock, Chas. Frederick	Smith, Thomas Macdougall
Harrison, John	Suter, Richard
Hatch, Rev. Henry	Sykes, Col. W. H., F.R.S.
Heaton, John	Turner, Edwin
Henley, Thomas Frederick	Turton, Thomas Burdett
Herbert, Rt. Hon. Sid., M.P.	Weallens, William
Hill, Henry	Wheatcroft, Joseph
Hornsby, John Harwood	Woods, Henry
Hucklebridge, Jas. Marwood	Wright, William
Hulett, David	Wyld, George, M.D.
Johnson, Richard	Young, John
Laidlaw, David	

The following Institutions have been taken into Union since the last announcement :—

404. Broseley Reading-Room and Library.

405. Salford, Royal Borough Museum and Library.

The paper read was :—

ON THE CONSTRUCTION OF PRIVATE CARRIAGES IN ENGLAND; AND ON THE CARRIAGE DEPARTMENT OF THE PARIS EXHIBITION OF 1855.

By GEORGE N. HOOPER.

The Society of Arts some months ago entrusted to me the examination of the Carriage Department of the Paris Exhibition. I have since been requested to add, as a preface to the notes made on the subject, a few remarks on the construction of carriages in England. I should state that

my experience being connected with private carriages, my remarks will be chiefly devoted to them.

One of the first requisites for a good carriage is good timber; and it is equally essential that it should be thoroughly seasoned. The whole stock of timber of a good coachbuilder should be carefully selected by himself or a trustworthy foreman. Our English hedge-row ash is an excellent timber for the parts requiring most solidity and strength; it is tough, close-grained, and durable. English oak of small growth furnishes excellent wheel-spokes, elm being generally used for the stocks or centres of wheels.

America furnishes birch and pine of excellent quality, straight and close-grained, free from knots, and well adapted for cutting into boards of various thicknesses.

Mahogany from Honduras has, up to the present time, been found the most suitable wood for carriage panels; it is straight-grained, bends readily, and retains its shape, when fixed, better than any other wood yet tried for the purpose; it is, however, necessary that the wood should not have a figured or prettily-marked grain, as it would be rejected as unsuitable, because the sun's action on the panel during hot weather would cause blemishes, by showing up the grain of the wood under the varnish.

Of the necessity of thoroughly dry wood being used for carriages, I may mention that during hot weather in summer, after a close carriage has been standing for some time in the sun, the upper panels become so heated as almost to blister the hand if applied to the surface more than a few seconds. Unseasoned panels would, on such a trial, not only split, but expose the joints of the framing, let in the wet, and lay the seeds of a premature decay. To counteract the severe effects of such heat as much as possible, and also the effects of wet and damp, the upper parts of the best carriages are covered with a hide of thick leather, put on in a wet state; this being strained and fastened, shrinks in drying, and forms a durable outer covering, perfectly free from any crevice which might allow a particle of wet to get under it. This leather, when dry, is painted and varnished about twenty-five times.

A second essential is good iron; this England also furnishes, of excellent quality and at a moderate price. Connected with iron are axles: this is a part in which English carriages claim a decided superiority over foreign ones. The pattern and plan of making them was patented many years ago by Collinge. With various modifications it is now almost universally in use in England, and it has been adopted in nearly similar forms in many foreign countries. The axle-arms should be forged from the best iron bars (6 or 9 is the usual number), a process technically called "faggotting," as by this means the iron acquires its extreme degree of tenacity—a point most imperative for safety in a carriage—as the concussions on an axle on a rough road are quite as trying to iron in this form as to any other purpose to which it is applied. When the axle and its covering, technically called the "box," have been accurately turned and fitted together, they undergo a process called "case-hardening," by which the bearing surfaces outside the axle and inside the box become intensely hardened, while the internal structure of the iron retains its original state of toughness. They are afterwards again fitted together, and on the accurate manner in which this is effected depends much of the quiet and easy running of a good carriage: if too tight, they are apt to stick fast, and entirely stop the further progress of a carriage; if too loose, they rattle, and soon wear out.

After axles, springs claim attention. They should be made of steel, converted and rolled from the best Swedish or Russian iron. Attempts have been made to use steel converted from English iron for this purpose, but chiefly for common carriages. It is likely that steel of excellent quality will eventually be made from iron drawn from other countries than Sweden and Russia, whence we have up to the present time obtained our chief supplies, for making spring steel.

Varnish is an article of considerable importance to a good carriage; it not only assists to beautify it, but materially adds to its durability by preserving the wood and iron from decay and rust. The only sort of varnish yet found suitable is that made from copal gum.

Oils are indispensably necessary. They consist of olive oil for lubricating the axles, and linseed and boiled oil for painters' work. They should all be of the best quality for their several purposes. Turpentine is also used.

Paints of various kinds, coarse and fine, are in constant use. The former are white lead, ochre, and American mineral paint, used for filling up the grain of the wood previous to applying the fine paints. It is composed of an earth, found as a sort of clay in the vicinity of slate formations. It realizes some money in this country, and would probably be found in England if the trouble were taken to search for it. The fine paints range from the moderate-priced greens and browns to the luxuriously-expensive, lakes, cobalts, and carmines.

Silks are of some importance; formerly a kind called luteastring was in use; this was superseded in England many years ago by a strong ribbed silk called "tabaret." After a time it was copied in France, where the manufacturers considerably improved it by overcoming a difficulty, and producing a figure on the surface. This was copied in England, about eight years ago, with much success, and has now almost superseded all other kinds for carriages; it is called "reps" in France, and "brocattelle" in England. The improvement in this kind of silk goods has been so rapid in England for several years past, as to have overtaken the French fabricants, with a good chance of surpassing them in quality, at a lower price.

Carriage laces appear to have been made for many years in this country of a quality far superior to the foreign laces; they have, however, now succeeded in making them of excellent quality on the Continent. The Germans have been introducing a considerable quantity of good lace to this country, for some months past, at a very reduced price compared to English-made laces. This, however, will probably soon be counteracted, as it has caused some enterprising manufacturers in Coventry to establish improved looms for this department of weaving, and to produce goods of equal quality, at a somewhat lower price.

Leather is consumed in large quantities for carriages; the greater part of that used in London is tanned in Bermondsey; it is afterwards prepared in a great variety of ways by "coach curriers," specially for the purposes to which it is to be applied. Of late years, since posting became obsolete, carriages have been better taken care of, and many parts of a carriage to which a greasy black leather was formerly applied, have been replaced by a clean dry leather, having a brilliant black surface, produced by a process called "japanning." After the hides have been prepared of a suitable thickness, the grain of the leather is concealed by repeated coats of japan, carefully drying the hide after each application in a moderately heated stove, free from dust, as a very small quantity falling on the hide in its wet state, would inevitably spoil the even and brilliant surface of the leather. Some leathers are finished with this process, but those intended for covering the heads of open carriages, and called "enamelled leather," undergo a process called "graining." This is done by folding the hide together and lightly rubbing the japanned sides one against the other with a piece of wood having a toothed surface and held in the right hand. After this process, the leather, if good, shows a surface covered with small regular creases, which allow its being folded with only slight detriment to its appearance; if the leather is not good, the graining shows a series of large irregular creases, caused by the hide being what is technically called "loose," and is deficient in neatness of surface, elasticity, and durability.

Carriage wheels have attracted much attention, both as to the manner of making them, and the most advanta-

geous height for carriages drawn by horses. It may be said as a general rule that the centre of a wheel should never be so high as a horse's shoulder, at the point where the trace is usually attached to the collar; if it is higher, there is a tendency to drag the wheel into the surface of the road, and to produce great friction and resistance to its progress. If the centre of the wheel is too low, the tendency would be to lift it off the ground, and cause the horse to carry a certain part of the weight of the carriage; the height of the wheels should therefore be always proportioned to the size of the animal to draw them and the purpose to which a carriage is to be applied. In some cases high wheels may be advantageously used, while in others, either the comfort of those using the carriage must be sacrificed, or some convenient point must be abandoned.

Three different kinds of timber are generally used in every carriage wheel, according to the strain which each part is intended to bear; the centre or stock is pierced all round its circumference with mortices to receive the spokes; it is again cut away at its centre to receive the iron box of the axle; for this purpose elm is employed, as it has the advantage of great toughness and strength to resist splitting.

The iron boxes being fastened in the stocks, by driving oak wedges all round them, is a very severe trial of the toughness of the wood, and any tendency to splitting is counteracted by driving on an iron hoop at each end of the stock. The spoke, being destined to support the wheel in an upright position, requires a wood to be hard, tough, and with a certain amount of elasticity. Oak is almost invariably used for this purpose. The wood of small trees is preferred, and the spokes are always split and chopped into shape, in order that the grain of the wood may run from end to end of the spoke, and give its utmost strength; were they sawn, it is possible the saw might not always follow the grain of the wood, and in that case the spoke would almost infallibly break when in use.

The felloes or outer wooden rims are made of the toughest ash, as, on account of their curved form, the hardest and closest grained wood is necessary to prevent them breaking in rough roads. The iron rim or "tyre" fixed on the outer circumference of the wheel, is made of an iron more desirable for its toughness than its hardness, as the breaking of a tyre might cause a serious accident. It is bent and welded into a circle, then placed in a furnace, and heated in a wood fire till it becomes red hot; it is then quickly driven on to the wheel, and suddenly cooled in water. This causes the iron to contract, and firmly binds the several parts of the wheel together; the tyre is fastened to the felloes by a few iron rivets.

Many wheels have for several years past been made by machinery, and it is a disputed point whether those made by machinery, or by hand labour, are the best. It may, I think, be conceded, that good wheels may be made by both means. Machinery not properly looked after may produce a bad wheel as well as a careless workman.

Springs have been made in an infinite variety of patterns. They may be divided into two classes—those which require a perch to assist in connecting them with the front and hind wheels, and retain them in their proper position, and those which do not require a perch, but are connected in some manner directly between the body and the axles. The former are generally used in connexion with leather braces, and the latter with eyes coupled together, with a bearing bolt and nut. Of late years indiarubber has been tried in connection with steel springs, or as a substitute for them. The firm to which I belong have, with several useful suggestions from Col. the Hon. G. Cadogan, adopted the suspending plan to a carriage which has now been in constant use for three years; the motion is soft and easy, and the caoutchouc is nearly as good now as when it was first new. The same suspending plan has, with several modifications advised by Col. Malcolm, recently been adopted by our government in the suspension of the hospital carriages sent to the army in

the Crimea. At Woolwich arsenal, where many plans were submitted and experimented on, it was found to be the most simple, easy, and readily replaced spring in case of accident.

These springs are peculiarly adapted for military use, as in campaigning, by taking a supply of them with the army, the waggons and carts of the country can in a few minutes be converted into easy conveyances for the sick and wounded.

Mr. Fuller, who has given much attention to the subject of indiarubber springs, and has patented several useful plans, seems likely soon to be able to produce one suitable for carriages without a perch.

Carriage workmen are divided into separate classes and trades. They are—"bodymakers," who frame and make the parts in which persons sit; "carriage makers," who make the under works, apply the parts necessary for locking or turning the carriage, fix the axles, springs, &c.; "wheelers" or "wheelwrights;" "joiners," who make the glass frames, blinds, boxes, trunks, &c.; "fitters," who fit and suspend the bodies on the under works, apply the various parts furnished by special manufacturers, such as lamps, handles, &c.; "body and carriage painters;" "trimmers," who fit up the insides of carriages, fix the silks, cloth, and laces, in the necessary parts; "leather workers," divided into cutters, sewers, seat trimmers, harness makers, from the different works they are engaged upon; "smiths," divided into carriage smiths, body smiths, tyre smiths, spring smiths, from the separate branches they are employed upon; "vicemen," who chisel and file the ironwork made by the smiths; "carvers;" "sawyers;" "polishers," who produce the brilliant polish on carriage panels. The "herald painter" of course devotes himself specially to his own department.

"Caners." This branch is usually undertaken by women, who interlace the neat canework now so fashionable on carriage panels. "Lining women," who sew together the cloth, silk, lace, &c., after being cut out by the trimmer.

During ten or twelve years past a great improvement has taken place in the habits of the carriage workmen. It may be partly accounted for in the generally-improved education of most working men, but more to regular hours of work. In the old times of travelling post, seasons of great briskness and dullness of trade alternated. At times men worked far into the night, and at other times had not sufficient occupation; this led to irregularity of habits and frequent drunkenness. Intoxication is now rare among the men; and a man who so misbehaves himself is looked down upon by his fellow-workmen instead of as formerly, merely as one who adhered to the customs of his ancestors. In proof of their improvement, I may mention that seven workmen whom our firm sent over to the Paris Exhibition, to examine their special department and visit some of the Paris manufactories, I believe all behaved in such a manner during their visit to the French capital, as was very creditable to them as representatives of their class of operatives in England.

Each man on his return produced a written report of what he had noticed good or bad in foreign manufactures, and in what he could improve his own productions.

There is, however, still room for improvement. Every man should be fully able to read and write, and each mechanic should have some knowledge of drawing, to facilitate his work, and to enable him to prepare his patterns, instead of being almost entirely dependent on his foreman or employer for such assistance.

The younger men might with more regularity attend the Schools of Design. They do not seem yet to appreciate their advantages.

While on the subject of workmen I cannot refrain mentioning their dwellings. I believe them to be inferior and more expensive in London than those inhabited by workmen of similar occupations in the country. If they had clean, well-drained, and well-ventilated dwellings, I feel convinced they would work with much more comfort

to themselves, take more interest in the uniform goodness of their work, and go through it with more cheerfulness than when occupying small, badly-ventilated, and ill-arranged lodgings.

The organization of labour in this manufacture is divided into day-work and piece-work, each being adopted where it is found most convenient.

Each department has its foremen, who is responsible for the quality and pattern of the work produced under his control. He receives orders what to employ the men under him upon; if employed by daywork keeps an account of the time his men work; what each does for the wages he is paid, and of all the work turned out by his department. If at piece-work, he employs men of his own choice to work under him, and makes up his account weekly or monthly, as the nature of his occupation admits.

It has been found beneficial to pay the men their wages on Friday instead of Saturday, as formerly. It was thought by some that in adopting the former day they would not work on the Saturday, but it seems to make no difference in this respect. It enables them to supply their wives with money to make their weekly purchases on the Saturday morning instead of night, leaving no excuse for marketing on the Sunday.

We have recently been somewhat successful in producing perspective views of carriages by photography; it was a difficult, tedious, and expensive process to produce perspective drawings of carriages by hand, and was rarely resorted to. By these views, persons unacquainted with the details of carriage construction, can more readily judge of their general effect than by an ordinary side view.

In order to carry on this or any other manufacture with profit, and with proper economy, it is of the utmost importance to avoid "loss and waste" in the details of manufacture. To this coachbuilders are particularly liable, from the variety and value of the materials they employ, and the carelessness of workmen. A good set of books, well kept, may in a great measure reduce them to a minimum. They should be:—

- Waste book,
- Remembrancer,
- In and out book,
- Foremen's day books,
- Great day book,
- Journal,
- Ledger,
- Carriage stock book,
- Material stock book,
- Customer's order book,
- Tradesmen's ditto,
- Estimate and letter book,
- Tradesmen's price and circular book,
- Workmen's employment book,
- Prime cost book,
- Customer's account book,
- Tradesmen's account book,
- Rent, insurance, and tax book,
- Besides the usual banking books.

In addition, each workman drawing materials should have a small book in which may be entered all he receives, having to enter against it the use to which he applies it.

We are in want of several improved materials and appliances to improve and facilitate the manufacture of carriages. Among the former are—Colourless oils for painter's use; a colourless varnish—all the copal varnishes now in use having a brown tinge, which is injurious to delicate colours; a durable ultramarine blue; cheaper and more durable lakes. Among the latter is a machine for sewing leather for carriages and harness. Though various attempts have been made, they have up to the present time been unsuccessful, as they will not work with a strong waxed thread, or draw the stitches sufficiently tight. A mechanist producing such a machine at a reasonable price, would have a large demand for them,

as, besides the great quantity of leather-sewing required for carriages and carriage harness, saddlery, army accoutrements, and military harness, would lay claim to its assistance.

THE CARRIAGE DEPARTMENT OF THE PARIS EXHIBITION.

It may be remarked, in examining the carriage department of the Paris Exhibition, as of the Exhibitions of London and Dublin, that none of them contained a single specimen of a posting travelling carriage, such as before the construction of railways was as necessary a part of the establishment of a nobleman or rich landed proprietor, as was his service of plate or his valet. Travelling is so altered with the almost universal system of railways, that such carriages are now only retained by Royal personages and others of high rank. Railways have however in other ways affected the manufacture of carriages. Formerly it was of the utmost importance that a carriage should be very capacious, as journeys frequently occupied several days, and a frequent change of position, and room to sit comfortably, were essential to a snug journey. On account of their great size and the quantity of luggage they had to carry, it was necessary to make them strong, not only to sustain the weight put on them, but to resist the shocks and concussions on bad roads. All classes being now conveyed by railway, renders such carriages almost obsolete; in fact, they are only required for travelling in remote parts, where railways do not exist.

An omission in each of the Exhibitions has been the almost entire absence of public carriages for common roads; such carriages are still required where no railroads are made. It is true there are very few four-horse coaches, "the pride of the road," now running in England, but considering the high degree of perfection such conveyances had attained before the introduction of railroads in England, an example of one of them would have been worth sending to the Paris Exhibition, as not only in France, but in other countries of Europe, are the public conveyances travelling distances fifty or more miles apart still of the most cumbersome and clumsy construction. It may be said that for every two passengers conveyed by an English stage or mail coach, taking weight for weight, a French "diligence" or German "eilwagen" only carried one passenger, and that at little more than half the speed of our English coaches. Many continental roads are now as good as English roads, and foreigners may much increase the speed of travelling where railways are not yet made.

The public carriages for towns and cities are only represented by one omnibus. No Hansom's cab appears, nor does Paris show any of the little four-wheel phaetons now so numerous in the French capital. A London four-wheel cab would certainly not shine in such an assemblage, but a comparison of the public carriages of the great European capitals might have led to improvements in all.

Very few of the builders of the first class of carriages in London or Paris contribute to the present Exhibition. Were the system of prizes abolished, and the public left to form their own judgment of what was placed before them, they would probably come forward and materially raise the character of the productions sent to such Exhibitions. The award of a prize medal does little good to such houses as are already well established and doing a large trade, whereas the withholding one (either from the jurors being deceived by a novelty without utility, a "tour de force," or a display of profuse decoration,) may do them an injury, which they prefer not to risk.

The countries exhibiting are England and Scotland, France, Belgium, Hamburg, Austria and Lombardy, Sweden and Norway, Sardinia, Holland, Canada, Switzerland, and Mexico.

Those not represented are Prussia, Saxony, Hanover, Bavaria, Russia, Ireland, Spain, Portugal, Naples, the Roman States, and United States of America.

It may be safely said that as far as the Exhibition

represents the state of comparative excellence, England maintains her position for turning out soundly-made and well-finished carriages; constructed so as to give comfortable accommodation to those who use them, and in such a manner that the proportions are well balanced; strength being applied to those parts where it is requisite, and unnecessary material and workmanship avoided where it can do no good. In a point where English carriage builders might possibly have been expected to be somewhat behind, they still take the lead; the outline and proportions of their carriages are superior to the foreign ones. English coach-builders have maintained simplicity of outline with elegance, and have made their carriages for what they are intended, and not as specimens of what it is possible to accomplish. Many of the English exhibitors in this department are themselves practical draughtsmen, and have worked at the actual framing and making of carriages, whereas the foreign builders, although in some instances good draughtsmen, have not worked at the actual framing and construction of carriages, but at the after fitting of leather work and lining; these parts in consequence attract their chief attention.

France sends several well made carriages; the best are those made after English models; they are well proportioned, with good workmanship, avoiding useless labour and worthless decoration. Some excellent enclosures for converting open carriages into close ones are shown. Lille and Bordeaux follow closely on Paris in the quality of their carriages.

Among the French carriages a large proportion are mere "tours de force," only fit to be kept in a room. The decorations are almost their only feature (the two lamps on one carriage are said to have cost £80 sterling, and they are certainly very beautiful). Such carriages will, probably, be rewarded with a prize medal, from the mere amount of money spent on them; and almost any amount of decoration can be had in Paris, where money is forthcoming.

France also exhibits several plans for detaching runaway or fractious horses from carriages, but they all seem to have the objection that the horses may become detached by accident, and probably cause the evil they are intended to avoid. It would be better for French drivers to attain greater perfection in their calling; they seem to drive in the most careless manner possible, almost invariably with loose reins, not keeping a sharp look out in front, or on their own side of the road; it is not uncommon for the driver of a diligence to sit on the reins of the five horses he is driving, while with the whip in both hands, he lashes his rough stallions, each in his turn, and in proportion to his merits. While such driving continues accidents must be unavoidable.

The present Emperor has given a great stimulus to the building of carriages in France. Having resided so long in England, he has imbibed a taste for carriages and horses. Of the former he has had a very large number built since he has been in France; they are nearly all in the English style. His dress carriages are decorated with extreme richness. Giving a very large price for the best English horses, his equipages are such as are not to be equalled in appearance in any other capital. This has set a fashion in Paris for good carriages, and has of late years rendered the trade of coachbuilding in the French capital very flourishing.

Paris makes a number of carriages for foreign countries, chiefly Spain, Italy, North and South America, and Egypt; moderate duties favourable to the French, and a liking of many foreigners for their rich silk linings and fittings, are probably the cause of this export trade.

The prices of the best French carriages are now about the same as the English. Their system of ready money transactions with their customers facilitates their operations, and enables them with a moderate capital to carry on a good trade, whereas the long credit taken by many persons using carriages in England cripples the trade, and causes such persons to say that English carriages are

expensive, whereas those who pay at once for what they buy get their carriages quite as cheap, quality considered, as any foreign country can produce.

Hamburg shows a single carriage of excellent workmanship, though from its contrivance, it is not likely to be comfortable for those who use it. Hamburg has probably advantages for coachbuilding from the absence of customs duties. It is said to have the largest private carriage manufactory in Europe, carrying on trade with Russia, Northern Germany, and other parts.

Belgium shows a variety of carriages, chiefly in the French style, but most of them, although cheaper, of inferior workmanship to the French. Antwerp, a provincial town, shows some carriages superior to those of Brussels, the capital.

The Belgians seem, like the French, to put much useless work in their carriages.

Sardinia shows a carriage of sound construction, good finish, and proportions.

Austria sends several carriages; they are all of inferior workmanship, of bad outline and proportions, mostly very heavy, and of rough finish.

Canada shows two light carriages of moderate workmanship.

Holland contributes a variety of carriages:—a barouche made to the order of the King shows some good workmanship; a phaeton, except the wheels, entirely of iron, also shows good workmanship, but such carriages have been found not to answer on common roads, from their being too rigid—a certain proportion of wood in combination with the iron deadens the concussions of the road, and imparts a certain amount of elasticity, which tends much to the durability of the carriage.

A two wheel carriage shown, with picture panels to the body, hung on leather braces only, without springs, would have a very rough swinging motion; it seems built for one of the Dutch colonies in the East.

Sweden and Norway show some well-made sledges, with excellent fur appointments. Norway shows some light two-wheel carriages, each to carry one person. Two are without springs, and must be unbearable, except to those accustomed to their use. One has so many springs, that in bad roads it would be difficult to keep one's seat, from the rolling motion it would have while in use.

Mexico sends an elaborate open carriage, with enclosures to carry four persons inside. A great amount of useless labour has been expended on the carriage; it is loaded with ironwork, which, though very well made, adds a most unnecessary weight to it. Although called a Mexican carriage, a great part of it was made in France, and sent to Mexico, where it was put together. After its re-entry into France, it was again overhauled, re-varnished, and partly repainted. Being so much better a carriage than a country like Mexico might be expected to produce, it is in fact only a "tour de force," produced, it is said, at the expense of the Mexican government, regardless of outlay, and of its not being made in the country whose manufacture it is intended to represent.

With the exception of Ireland and the United States of America, the manufacture of carriages in the rest of the world may be said to be in a backward state.

With regard to what is new in this department, the advance made during the last few years must be looked for more in improvements and useful adaptations, than in any striking inventions. Coach-builders are bound within certain limits. They have to provide vehicles to carry one or more persons, on two or more wheels; and the immense variety of carriages that have been made, attests a very fair amount of ingenuity. Although the show of carriages from England is small compared to the contributions of the whole continent, it may be said that foreign builders have more to learn from the English carriages, than the English builders from the foreign ones, the best foreign carriages being still built in the English style.

The carriage called a "sociable," sent from England, is new to foreigners, and has already caused many to be

built in Paris like it. The Emperor of the French procured two such carriages from England expressly for the use of our Gracious Queen while in Paris. A phaeton, with a novel kind of head, to lift by a very simple plan, has attracted attention; the plan will probably be adopted by some of the foreign builders. A "Pedomotive" is shown, consisting of a very high wheel, having a seat attached to both ends of the axle, which passes through both sides of the centre of the wheel, and affords locomotion to two persons, who keep it moving by a light run. The inventor asserts that a high speed can be attained on a good road by his invention. Some very good machine-made wheels are shown in the English department. There are also shown some good perspective views of carriages, produced by photography; they are among the first produced by this means. There are also shown some good specimens of carriage laces. Among them are illustrations of a plan invented by Mr. Dart, for weaving consecutive numbers in lace, or even sentences, which, though not applicable to private carriages, may well be applied to the interior of railway carriages, and to the numbers on the collars of police and soldiers' coats, caps, &c.

In the French department a coachbuilder shows an excellent full-size drawing of a carriage. It is chiefly noticeable for its good drawing, and not for its proportions and contrivance. A carriage is shown with panels of glass. Such a carriage offers little chance of durability, though to overcome the difficulties of bending and fixing the panels, shows a great amount of perseverance; it is an inferior carriage, with tawdry decorations. It is said to be sold for Mexico.

France shows a public omnibus of sound workmanship. It is much heavier than most English ones, but will carry fourteen passengers inside comfortably, each in a well defined and separate seat; ten persons can be carried outside on a seat running from end to end of the roof, passengers sitting back to back. A convenient raised rail surrounds the top of the omnibus and ensures the safety of the passengers, as it is not difficult to lose one's balance on taking or leaving a roof seat, should the horses move the carriage during the operation. The steps to ascend to the upper seats and descend are very conveniently arranged. The driver is intended to sit quite alone. There is no door behind, the conductor standing on the step, and being prevented falling by a loose moveable strap passing across the doorway; he is protected from the rain by a portion of the roof projecting over the step. The hind part of the omnibus is provided with a dial, numbered, and having an index-hand working from the centre, which the conductor has to move forward at the entry of each passenger, and at the same time causing a bell to ring. The state of the index is read off by a clerk as it passes any of the branch offices on the line of journey; the dial apparatus is opened and set back at the commencement of each journey, when its numbers have been finally read off. This is an excellent plan for keeping the money-taker honest. The driver can be signalled when to stop by pulling a cord so arranged as only to give a slight pull to his arm. The front springs are arranged in the same manner as the hind ones, namely, two side springs with a cross spring. For heavy carriages, which carry uncertain loads, sometimes under, and frequently overloaded, it is an excellent plan, and so much better than the short stiff elliptic springs invariably used for the front parts of English omnibuses.

On some of the French carriages are some pretty specimens of chased metal decorations—silver on gold, and *vice versa*.

The French especially show a multitude of plans for shortening the distance between the front and hind wheels of their carriages; they mostly consist of arrangements of slots of various shapes and curves, working on two fixed bolts. All such plans cause a rattle soon after being put into use, on account of the wearing of the slots and bolts.

There are also some carriage shafts shown, formed of bundles of cane bound together with wire. The inventor

says it is impossible to break them by a horse falling; on the other hand it is said they cannot be made to retain their shape, and bend too much when in use. Some axles are shown with the grooves in the boxes slightly spiral instead of straight; they catch up any grit which may by chance get into the box, and constantly carry up the oil to the back of the axle when in use. There are also some axles made on an economical plan for common carriages; there is only a small collar to the axle; the reservoir of the box covers it, and keeps out grit; the collett and nut are in one piece, and of iron; the cap to contain the oil in front is of cast-iron.

Some very ingenious machine-worked panels are shown. They represent various patterns of basket-work in excellent imitation, and are used in France for panels of sporting and light carriages. Some economical elliptic springs exhibited are made by turning up the end of the back plate on edge, and passing a bolt through a hole in each plate. They may well be applied to light, common carriages for country use. There are also some well-contrived single and double carriage-steps, opening and shutting with the carriage door.

Many of the French carriages have the spokes of the wheels made of acacia instead of oak. This is a wood which has been extensively used in France of late years for this purpose; the French builders speak very highly of it, and maintain that it is far more durable than oak. The wood brought from the *Département des Landes* is considered the best, on account of its toughness and the closeness of its grain; it may be procured from Bordeaux. For light wheels they are using tyres of what they call "acier naturel." What this is I have been unable to ascertain; whether a cast and rolled steel, or iron treated by some method to harden it. It welds as well as iron.

The *Messageries Generales* show a military hospital waggon for the conveyance of wounded or sick soldiers. It seems a much more cumbersome affair than those lately made for the British army, and would occupy double the space on board ship. The English carriages for a similar purpose are much lighter, and fold up for conveyance by sea, or for storing away when not required for use.

Several harnesses are shown, made in such a manner that the horses may be instantly freed from a carriage; the same remark applies to them as to the plans for detaching horses from a carriage, by apparatus connected with the carriage.

Among the French harness one is shown in which the buckles are replaced by screws and boss-nuts. Another is shown in which the strapping is kept together by screws and flush nuts instead of sewing. A harness already used two years is shown as a proof of its answering the purpose intended. It seems a suitable plan for common harness.

The chased-metal work on some of the state harnesses exhibited by France, is very beautiful; though they, like some of the carriages, are too elaborate and delicate for actual use.

Ireland sends a harness having a neat plan of super-seeding buckles. The straps pass through two metal loops, having a projecting pin between them, which passes through a hole in the strap to be attached.

London shows some chased harness ornaments in very good taste.

Holland shows some driving-reins of cord, plaited in a very neat manner.

In the south of France they have an excellent plan of fastening the breechings of horses to the pole pieces, instead of to the collar. By this plan the strain of the breechings in descending a hill is thrown on the horses' hind-quarters only, and not partly on the neck, as in the plan in use for harnessing horses in England.

Belgium sends a railway carriage having a compartment in which frames draw out to connect the opposite seats; a cushion can be placed on the frame, and the seat cushion can be so propped up as to form a pillow, thus enabling passengers to lie down in trains travelling by night, or for

many consecutive hours. This plan would add considerably to the comfort of passengers, at a trifling expense to the railway companies.

The second-class compartments of all the foreign railway carriages shown have comfortably stuffed cushions and backs, very different from those of the English railway companies, who seem to vie with one another as to which can make their second-class carriages most uncomfortable.

Switzerland shows two excellent railway carriages; one is on the American plan, having a passage in the centre from end to end. The seats of the first-class compartment are most comfortable, and the seats for the second-class passengers are cushioned, and have stuffed backs.

Almost all public carriages on common roads in France, and even the carts and waggons, are fitted with what they call "*mecanique d'enrayage*." It consists in applying a pressure to the outer rim of the hind wheels in descending hills; the pressure is applied either with a screw or lever. Drag shoes, as used in England, appear to be almost out of use. The plan has the advantage that when a carriage is once fitted with the apparatus, it is no longer necessary to stop the carriage on approaching a hill, or after one has been passed, as is necessary in applying and removing an ordinary drag shoe.

A great variety of useful woods, suitable for carriage building, are shown by the English colonies. The immense consumption of wood for the building of railway carriages, vans, trucks, &c., and also for agricultural implements, has drawn largely on the supplies of ash, elm, oak, pine, and Honduras mahogany, formerly at the command of coach-builders, and renders it desirable to look for new sources of supply. Among the foreign woods are many better suited for their purpose than those of home growth.

The supplies of mahogany from Honduras, and of sound white pine from North America, have of late years been very precarious, and the price has accordingly been high. Several French coach-builders have within a few years used Honduras mahogany for panels, but are now returning to the French walnut they formerly used. They say that although the mahogany panels keep their form well, the grain of the wood, being more open than that of walnut, does not retain the brilliancy of the varnish so well as the walnut, which has, however, the disadvantage of becoming uneven and puckered if a carriage is much exposed in the sun's rays. It may be possible to procure a wood which shall combine the good qualities of both without their bad points.

Canada shows some excellent specimens of timber; among them the following are very suitable for coach-building:—

For spokes and underworks—Smooth bark hickory.

For panels, footboards, &c.—Sycamore.

For framing—White oak, white ash, and black ash.

For blind frames—Red cedar.

For roofs, bottoms, &c.—Soft maple and lime.

Also dressed hickory spokes, prices from 16½ to 22½ francs per set of 60. Oak spokes somewhat cheaper.

New South Wales contributes an exceedingly well-arranged series of excellent close-grained woods. Among those suitable are—

For roofs, bottoms, &c.—*podocarpus spinulosus* (pine), *ceratopetalum apetalum* (lightwood).

For panels—water gum (*tristania neriifolia*), blue gum (eucalyptus), swamp mahogany (eucalyptus), *cedrela Australis* (cedar), *Meliaceæ* (rosewood).

For spokes, poles, &c.—*cargillia Australis* (black plum), *acacia binervosa* (blackwattle), *acmena*, *acacia*, *bastard box* (eucalyptus).

For framing, under-works, felloes, stocks, &c.—iron bark (eucalyptus), woolly butt (eucalyptus), *notoela*, *acacia longifolia*, teak, rosewood (*meliaceæ*), mountain-ash (eucalyptus *pillularis*), blue gum of Camden.

For blind frames—beef wood (*stenocarpus salignus*).

The woods of the Cape of Good Hope are also of excellent quality. Among the following are suitable:—

For panels—yellow wood, *pterocelas*, *Urus rostratus*, sneeze wood (*Pteroxylon utile*), saffron wood (*Eladendron croceum*), *Weinmannia trifoliata*, *Oreodaphne bullata* (stinkwood), *Widdingtonia juniperoides*.

For under works—stinkwood (*Oreodaphne bullata*), assigie, *canthium* (Cape teakwood), *myrsine melanophloeos*, *olea verrucosa*, *olea laurifolia* (black iron wood), *olea capensis* (ironwood), *gonioma kamassi*, *buddleia salviaefolia*.

For spokes, poles, &c. —*Halleria lucida*, *acacia horrida* (thorn tree), *phoberos mundtii*, *pappea capensis*, (wild plum tree), Cape ash (*Eckebergia capensis*), knobhout, *Fagarastrum capense*, *ochna arborea* (redwood), *zybast silk-bark* (*celastrus acuminatus*), *olinia capensis*, *royena lucida*.

For elastic gig shafts—*grewia occidentalis*.

For bending—karreehout (*Rhus viminalis*, Vahl).

For framing, felloes, &c.—*cassine colpoon*, *schotia tamarindifolia*, *hassagay* (*Curtisia faginea*), *gardenia thunbergia*, *gardenia rothmannia*, *plectronia ventosa*, *kreupelboom* (*Leucospermum conocarpon*), *niebuhria Caffra*.

For blind frames—lepelhout (*Hartogia capensis*).

For roofs, bottoms, &c.—*kafir tree* (*Erythrina Caffra*).

The pamphlets describing the woods of New South Wales* and the Cape of Good Hope† are most useful publications, and explain at once to practical men almost all they want to know as to the general character of the woods they describe. It is to be hoped that specimens of these woods will be collected and retained in some convenient building in London for inspection, with the names attached. The manner of showing the woods of New South Wales in large pieces, gives an opportunity of judging of the average diameter of their growth, as also of the description of bark grown on each specimen.

Van Dieman's Land, Bahamas, Victoria, Spain, Tuscany, Pontifical States, Jamaica, Mauritius, and Algeria, also show excellent hard woods.

Bengal shows specimens of many excellent hard woods, but for want of arrangement and classification little information could be obtained respecting them. The *acacia catechu* seems suitable for panels.

British Guiana shows woods suitable for panels. They are locust wood, *ducaballi*, *sweadani*, purple heart; also many others fit for spokes, under works, &c.

Ceylon shows some boxes made of a wood which looks as if it would furnish excellent panels.

It is said that British Honduras can furnish many excellent woods besides the mahogany exported so largely.

Bengal shows a specimen of fine long lustrous hair, as also some silky-looking vegetable fibres, suitable for parts of carriage laces.

It may be said, in conclusion, that England excels foreign countries in a marked manner, in the convenience and variety of the kinds of carriages made; in the simplicity and soundness of their construction; their durability and their capability of resisting the effects of climate, whether hot or wet; their axles, springs, carpets, floorcloths, leather and cloths, are superior to those used by foreign builders. Very few materials, with the exceptions of vermilion and ultramarine blue, are procured from the continent of Europe.

The French may be said to excel in the brilliancy of their varnishing; this must be attributed to their dry, clear air, as they, as well as most other Continental

builders, use English varnish in preference to any other. Their silks are somewhat richer than the English, and the linings are generally more richly got up than the English; they have also very tastily designed and chased metal ornaments. Their hammercloth trimmings excel the English; few persons in this country will afford the expense which seems readily incurred for such articles in Paris. Their carving is excellent; but for ordinary plain carriages is apt to get clogged with dirt, and to make a carriage look shabby unless thoroughly cleaned. Their iron work is exceedingly well forged and filed.

They procure various articles from England, preferring them to those made in France, viz., carriage designs, varnish, spring steel, carpets, painted floorcloths, wool rugs, files.

They have an excellent plan of preserving the pattern of the outline of their carriages by drawing them on brown paper of very large size; when not in use, the paper can be readily rolled up and put aside. They line many carriages with worsted velvet. It forms an elegant interior, and is very warm and comfortable for winter use. It is to be regretted that no English carriage-axles are shown, as they are made of excellent quality, and now at a moderate price. Being up to the present time prohibited entry into France is probably the cause; but until the French either produce or procure well-made axles, their carriages will not roll along as soundly and as quietly as English carriages. The English show no plan for detaching restive horses from a carriage against the numerous plans shown by the French. It may be, perhaps, inferred from this circumstance, that drivers in England rely more on nerve and self-possession with restive horses than on makeshifts to get rid of their charge on the outbreak of hostilities.

The system of jobbing carriages for a term of years, so largely carried out in England, seems to be unknown in the same form abroad. "Loueurs de voitures" certainly furnish carriages on hire, but always with the addition of horses, harness, and coachman, having generally the air of a hired turned out; whereas great numbers of the best private carriages in England are built to the order and taste of the party using them, jobbed for a certain term of years, and kept in good repair for a fixed annual payment.

The plan pursued by the Board of Trade of this country, in appointing a committee to carry out the arrangements for a creditable show in each trade, seems to have been successful in this department. Each of the English carriages is built for use, as well as show, and is ready to be put into immediate work at the close of the Exhibition; whereas a great proportion of the continental carriages, more especially the French, are specimens of a sort of "cramming" for the desired prizes.

The formation of the jury for this class seems to have received only slight attention from the Executive, as it does not contain among its members a single practical coach-builder. How far their awards will be appreciated by the public and the exhibitors, remains to be proved; impartiality almost amounts to an impossibility, when some at least of the jury are not practically acquainted with the details of the manufacture of which they undertake to weigh the merits. The exhibitors and manufacturers can easily judge of what carriages deserve favourable notice.

I can only regret that the examination of this department was not confided to one more competent than myself. Many omissions will be detected, but a limited stay in Paris may be pleaded in extenuation. My thanks are due to Mr. Logan and Mr. McArthur for the information furnished by their departments; as also to Mr. Audley for according me permission to make notes in the Exhibition building.

* * Since these notes were drawn up, the list of awards has been published. The awards and their classification for this department are very eccentric. It is difficult to guess what principle has guided their

* *Australie*: Catalogue des Collections de Bois indigènes des différents districts de cette Colonie. Par M.M. Macarthur, Commissaire envoyé à Paris pour l'Exposition de 1855, et Ch. Moore, Directeur du Jardin Botanique de Sidney. Paris: imprimerie Horticole de J. B. Gros, Rue des Noyers, 74.

† *Silva Capensis*, or a Description of South African Forest Trees and Arborescent Shrubs, used for Technical and Economical Purposes by the Colonists of the Cape of Good Hope. By L. Pappé, M.D. Cape Town: Van de Sandt de Villiers and Co., Castle-street, 1854.

selection; a feeling, however, exists among many British exhibitors that the original awards of the Jurors has been considerably altered by the Committee of Revision appointed since the dispersion of the Juries.

AUTHORITIES.

A work of the last century, by Felton.

Adams's "Pleasure Carriages."

Beckman's "History of Inventions."

Fairholt's article on "Ancient Carriages," in *Art Union Journal* for 1847.

DISCUSSION.

Mr. JAMES ROCK, jun., said that as a member of the Society, but more especially as a carriage builder, he was indebted to Mr. Hooper for having given a voice, though for a brief hour only, to a branch of manufacture which was usually voiceless, though, to the dishonour of road-making science, not so noiseless as it ought to be. The art of carriage-building appeared at this time to hold an anomalous position in the world of industrial art. Having no organ of its own, and being of too complicated a character to permit of much theoretical discussion by persons not practically acquainted with it, it had happened that at a time when the arts generally, but especially the simpler ones, were descanted upon and illustrated almost indefinitely in the periodical press, the art of coach-building seldom received the smallest meed of literary or scientific notice except when some garish conveyance was prepared to minister to civic pomp, or when the part which carriages occupied in most modern processional demonstrations was too obvious to be altogether passed over in silence. All the finesse of constructive art—all the nice appreciation of symmetry—all the taste in the selection and arrangement of colours—all the results of judgment in the selection and application of materials, and of the power to direct the operations of many dissimilar arts, and to combine their results so as to form one harmonious whole—all these, which go to the making up of a well-built modern carriage, appeared to be either beneath or beyond the power of our literary instructors to appreciate so far as this art was concerned. A carriage builder must be content if he succeed in pleasing his patron, and thereby obtain personal recommendations for the furtherance of his pecuniary interest, and yet the nature of his occupation should seem to afford some ground to lead him to look for higher success than this. It was but a grovelling ambition that sought only the increase of wealth, and he liked not to regard his business as permitting no other. He had long accustomed himself to look at the article which he produced in an artistic light. He knew by comparison with other professions, which made more talk in the world, and of which he had some slight knowledge, that there was in his own business more scope for taste than in most of the industrial arts, that it required no little knowledge of natural science, that, in short, it needed for its successful development, mental qualifications far beyond those which sufficed for ordinary trades. No one, however unacquainted with coachmaking practically, could have followed Mr. Hooper in his enumeration of the various branches which make up all that was understood by the term coach-building, without being struck with the truth of what he had said of the qualifications necessary for a coach-builder. He thought Mr. Hooper had mentioned nearly twenty distinct trades, not minute subdivisions of labour, such as the heading and pointing of a pin, but clearly-defined, distinct and separate trades, as different from each other as the tailor's art from that of the blacksmith, each having subdivisions of its own, and each requiring separate apprenticeship for the acquirement of manual perfection. The master coach-builder, if master of his art, required to be a compound of the artist and the engineer. There were many persons trading under the name of coach-builders, who did not manufacture all the essential parts of their carriages, but purchased them ready-made from practical

men pursuing the several branches of the trade. These persons were merely coach-finishers, not coachmakers; and he spoke not of these when he used the word coachmaker. Mr. Hooper had shown that the system to which he had alluded had prevailed largely in France. Wherever it existed it indicated a low state of the art. It was just the country village system, where the wheelwright makes the wood work of a cart or waggon, the blacksmith supplies the ironwork, and the village painter does the decorative. In Sweden, the trimmer is the ostensible coachmaker, who takes the order and supplies the carriage to the customer; at least it was so until recently. In 1851, an excellent practical coachmaker, who had been in his employ for several years, commenced business at Stockholm, and had after much difficulty introduced the best English system, which gives to the real coachmaker his proper position above the mere decorator. If, then, the coachmaker required to be a person of extensive knowledge, sound judgment, and good taste, and if the articles which he manufactured were such as to require the exercise of those qualifications, how was it that carriages had occupied such an anomalous, he might say so *low* a position, in the Universal Exhibitions of Industrial Art in 1851 and in the present year? Perhaps Mr. Hooper might have hit upon the right answer to the question when he spoke of the constitution of the jury of the class which included carriages, but he (Mr. Rock) thought there must be some other cause at work, some error in the conception of what a carriage was on the part of those who influenced the results of such Exhibitions; perhaps a want of power, from deficiency of knowledge special to the object to enable them to understand it, and to see what it involved. The aesthetics of coachmaking art had yet to receive the attention they deserved. As yet that art had had no Ruskin to do for it what he had done for architecture. Unluckily, carriages were cumbrous things for museums; they were perishable things, too; they were despised as they got old—they got applied to degraded uses—they got mauled and patched like Sydney Smith's "yellow convenience," and after all they soon passed away and were forgotten. There was no chance of a coachmaker obtaining posthumous fame, for the works of the artist perished before the artist himself. The more reason then that he should receive some measure of repute, if his works deserved it, during his lifetime; and when and where should he look for it if not 'at a universal gathering of the productions of art and industry. He did not hesitate to say that he had not received his deserts in either of the Universal Exhibitions which had yet taken place. In 1851 there were exhibited carriages of high character, but the Council medal was altogether withheld from the class (5 A), although the Exhibition included samples of the very kind of merit which the Council medal was intended to distinguish. In the Paris Exhibition, whilst crosses and gold medals had been freely bestowed on all classes except that of carriages, they had only received the lower classes of reward. As he received only a second-class medal, he could not be accused of personal pique in saying that those who received the first-class medal ought to have received the gold medal. If Mr. Peters had produced a carriage really superior to all others, why should not he receive a medal of honour? If there was in the British department of the Exhibition an example of an invention which, although not receiving special notice from the jury in 1851, had since then been brought into use in England to a considerable extent—had been patented by copyists in foreign countries, and in this Exhibition of 1855 had numerous imitators, especially in the French department—should not its inventor and exhibitor, who felt himself in the position of an engineer whose invention had been adopted by engine-manufacturers, find himself in a better position than the mere producer of a basket or a piece of crockery? He happened to be local secretary for his town (Hastings) for the Exhibition of 1851, and in that capacity he induced a man living in Sussex, who made a kind of basket of ancient origin, but

almost peculiar to Sussex, to exhibit some specimens. He did so; their utility was appreciated, and he received a prize medal. He exhibited again at Paris, and had been awarded the second-class medal. The basket was highly useful and worthy of reward, but its exhibitor was only the producer—the art of making it was one of the simplest, requiring only a knife, a hammer, and a bradawl as tools, and it seemed not quite right to have the same kind of reward for an article so simple as this, as for a machine which requires for its production the highest order of constructive skill. Mr. Fairbairn got a similar medal for his locomotive engine. He (Mr. Rock) got the same for his carriage. As Mr. Hooper had remarked, better that no prizes should be given rather than such a system of awards as this. He had more to say upon this subject, but he had already taken up too much time—perhaps he might return to it in the pages of the *Journal*. He should be glad, however, if any discussion here should help to settle the true position of the carriage manufacture in the industrial world—for it certainly was discouraging to a coachmaker to feel that he was following a profession in which by no amount of ingenuity or skill could, according to present experience, the highest honours awarded to industrial art be obtained. His question, expressed concisely, was this. Is or is not coachmaking an art-manufacture?—and if it be, is it not entitled to the highest awards in an Exhibition of Industrial Art, if the specimens exhibited are among the best that can be produced at the time of the Exhibition?

The CHAIRMAN said, as the subject of axletrees had been mentioned, perhaps Mr. Collinge would be good enough to say a few words on the subject.

Mr. COLLINGE remarked that his axles were generally so well-known, and so extensively used—at least imitations of them—that it would be a waste of time for him to say anything upon the subject. Most coachmakers knew what they were, and if he were to say much in favour of them it might be considered egotism.

Mr. ROCK asked Mr. Collinge if he could account for the setting fast of axles on railways.

Mr. COLLINGE said it arose from various causes, sometimes from the arms and blocks being soft; sometimes from the two surfaces coming in contact, which caused the metals to get warm and at last adhere. If they could manage to keep the wheels revolving, there would be few accidents from such causes.

Mr. NEWTON was surprised that some attention had not been paid to the subject of artificial panels for carriages, instead of employing wood for that purpose. There was a plan shown in the Exhibition for making them of thin veneers of wood, with a fabric between, that appeared to have answered the purpose exceedingly well, and he was rather surprised it was not mentioned in the paper. There was also a machine exhibited for cutting the fellows of wheels, and which he considered ought to have been mentioned. Many machines had been devised for that purpose, but they were found to be too complicated. The one he alluded to was a blade of steel, in the form of an endless band, which was set in motion, and the fellow was cut out with the greatest ease. He would suggest that Mr. Fuller should be asked to explain his vulcanised springs, as there were a great many specimens on the table, and a description of them would no doubt be interesting.

Mr. FULLER stated that his attention had been directed for some years past to the various applications of vulcanised india-rubber as springs—in the first instance, as buffer springs for railway carriages (for which application he received a medal from this Society in 1847), and recently as suspension springs for the lighter description of vehicles. In order to insure a perfect spring for this purpose, the india-rubber should be of the purest and best quality, prepared expressly for the purpose. The material when so prepared would bear extension to four or five times its own length without danger of breakage or

injury, and would maintain its elasticity permanently in any change of climate. According to his experience, the best form of application was a series of rings of perfectly round section (such as those exhibited), three-eighths of an inch in substance, and varying from two to three inches in diameter, each of which would sustain about 25 or 26 lbs., thus 20 or 40 of these rings would form a compact and powerful spring, capable of sustaining 500 or 1,000 lbs. respectively. Another material thing was to secure the bearing points of the spring from friction. This was effected by first stretching the rings to their extreme length (which was done by machinery) round two metal rollers or sockets, which received the bolts used in fixing, and binding the spring when in this state of tension, thereby confining the motion to the middle part of the spring. Up to the present time, these springs have been principally used for ambulance waggons for the wounded. Several hundreds were in use, and there could be no question that they formed by far the easiest spring yet discovered for the purpose. These springs might be made of any strength, from 2 cwt. to half-a-ton, and adapted to any description of private carriage. One principal feature, of novelty in the application to light vehicles was illustrated by a small hand-model, with two dumb irons, the axle being held in position by the horizontal tension of the spring itself, such spring being applicable in all cases where double elliptics are used.

Mr. CONYBEARE said that, as he had no special knowledge of coach-building, he would not have ventured to make any remarks on the excellent paper that had been read, had it not called up Mr. Fuller to describe his new caoutchouc carriage springs, exhibited on the table. He had been much interested in Mr. Fuller's explanations, but having himself made frequent use of the vulcanised rubber for various purposes, he would like to ask one question with reference to its use for springs. He had invariably found that after a time the vulcanised rubber rings, especially if subjected to continued tension, lost their elasticity in a great measure, and became more or less brittle. He had found this with vulcanised rubber in every form and size he had tried, though more especially with the smaller rings, when put round parcels of papers, and put away for a year or two. He suspected that this tendency to deteriorate in quality would be found to obtain more or less in such coach springs, however large, though the greater the surface exposed, the more rapid seemed to be the deterioration. He believed the effect would ensue, if sufficient time were given, as certainly as that the singular elastic substance, amorphous sulphur, would resume its brittleness, and to some extent its yellow colour. Was not the combined sulphur in the vulcanised rubber in this peculiar elastic condition? As he had been called upon to ask a question about the soft vulcanised rubber, he would venture to throw out a suggestion to the carriage-builders as to the hard vulcanised rubber, or caoutchouc durci. This singular substance, which is produced by a like combination of sulphur and caoutchouc, but subjected to a different range of temperature, might, he thought, make an excellent material for coach panels, and would not, he believed, be open to the objections made to the other materials for the purpose which had been canvassed during the evening. A gentleman who spoke immediately after the author of the paper, had complained that carriage-building did not lead to fame; and questioned the justice of no large gold medal being awarded to the exhibitors of carriages in the Paris Exhibition. Carriage-building, that gentleman had maintained, was a calling which required great taste, and very high qualifications of various descriptions, and ought, therefore, to be rewarded with gold medals, if any profession ought. Now Mr. Conybeare confessed, that whatever objections might be taken to some of the French juries and their awards, he had not seen in his inspection of the carriages exhibited any improvement so original or great as to be worthy of a large gold medal. He had no doubt that the more knowledge a man possessed, the better

for him as coach-builder, or manufacturer of any other description, but he did not think that coach-building should in that hall be set up as requiring, above other arts and manufactures, any very extensive knowledge. Reputations had been made; indeed Mr. Collinge had told the meeting truly, with reference to his patent axles, that their reputation was world-wide, and no doubt fortune as well as fame might be achieved by manufacturers in such circumstances. He (Mr. Conybeare) had heard of a coachbuilder, in the days of old mail-coaches, who had made a fortune by contracting to supply the Government with mail-coaches at a price so low that all competitors said he must be ruined. He knew, however, what he was about. In a coach, certain portions only wear out; he built all the mails on one model; so, when the old coaches were returned, he took out such parts, and, by their help, turned out a new coach at 75 per cent. of what it would otherwise have cost him. That was a clever fellow, and would have deserved a gold medal for a plan which tended to reduce the cost of carrying letters. Let Mr. Rock follow such an example, and, instead of complaining that coach-building did not hold the high position it ought to hold, set his shoulder to the wheel, push ahead, and make an equal improvement, and he would probably find that fame and fortune would not be so unattainable as he now believed. There was only one point in the original paper, or in the portion of it which Mr. Conybeare had heard, to which he would allude. Nothing had been said of that national vehicle which pervaded Ireland, in which all of us who had been there must have been jolted over its rough roads. The Irish might think there was some want of justice in this, the more especially as the application of a block of wood pressed against the hinder wheel, as a substitute for the old-fashioned drag, was an improvement which was to be found on the mail cars running to Bantry Bay, and in other rough districts, whereas the author of the paper had alluded to such a substitute for drag chains as if it were only to be met with on the Continent.

Mr. SLK inquired what Mr. Conybeare considered to be the cost of caoutchouc for the purpose of panelling?

Mr. CONYBEARE said it depended entirely upon the thickness of the panel. It might be made of the finest veneer. The price of caoutchouc might be obtained from any price current, which, with the price of sulphur and the cost of uniting them at a proper temperature, would give the cost of the article.

In reply to a question as to the durability of the material, Mr. FULLER stated that, as in all other manufactures, the material might be imperfectly prepared or injured in the process of vulcanisation, but when carefully prepared for the purpose of springs its durability could be fully depended upon.

Mr. PETERS denied the grounds put forward for the coachmakers of London not being more numerously represented at the Paris Exhibition. The real grounds were—first, because the room allotted to them was so exceedingly limited, each exhibitor only being allowed space for one carriage; and, secondly, the high rate of duty chargeable upon all English carriages sold there. It was the impression of many that coachbuilders were entirely arbitrary in their mode of fixing the charges for carriage building, such charges bearing no reference to the cost of production, and generally being far too remunerative, but this he begged to say was an error, as their charges were based upon a careful calculation of the cost, and a reasonable profit only made. If they had sent to the Exhibition, therefore, in order to meet the high duty with any profit to themselves, they must either have made what would have been considered an exorbitant charge for carriages exhibited, or have used inferior materials, and they considered, therefore, with due regard to their own reputation, that it was advisable no steps should be taken to induce English coachbuilders to be more fully represented than they had been.

Mr. NEWTON said, bending wood was an operation which had engaged the attention of engineers for many

years, and, easy as it appeared, it was very difficult in practice, as there was great danger of breaking the fibres of the wood even in the nicest operations. Another difficulty was, that when the wood had been bent, it would in time go back to its original shape. An American engineer, however, had invented a machine which entirely obviated those difficulties, by crushing in one side of the wood while it extended the other. He had seen wood which was bent in the most difficult forms and had stood the test of time, and it was a pity the invention was not more generally known, for it was an extremely useful one.

Mr. HOLMES said he was surprised to hear bent timber spoken of as of recent introduction in the construction of carriages, for the firm he had the honour to represent had used it in a variety of forms for more than thirty years, and many of the light barouches built at Derby 30 years ago had the bottom, sides, and pillars, bent by steam, in one piece, and they had stood remarkably well; besides which the heads, shafts, futchells, and other parts of carriages, had long been universally made of bent timber. He was also surprised to hear a single upright saw recommended for cutting out felloes of wheels. His firm had used a self-acting saw with double blades, which would cut out the felloes to any required radius, without the slightest attention after the rough felloe or piece of plank was placed in its position. It could hardly be requisite to add to the list of different woods used in carriage-building generally, but they had found fustic a most valuable substitute for elm, for the naves of wheels sent to India or any hot climate, and also hickory for spokes, but he recommended the hickory to be desiccated. Mr. Holmes bore testimony to the successful experiment of india rubber for springs as applied to the Hon. Colonel Cadogan's carriage, as mentioned by Mr. Hooper. When he saw the carriage a few weeks ago, the rings appeared hardly any the worse for wear. He did not however consider the mode of hanging at present adopted by any means efficient, for although the india-rubber rings were very elastic, the general case was not such as a coach-builder could pronounce perfect. He was rather surprised that his friend Mr. Hooper had not alluded more generally to the successful application of steam machinery, as already introduced in the manufacture of carriages in this country, for in addition to wood sawing and turning of every kind, his firm found that machines for grinding paint and for drilling, tapping, and screwing bolts and nuts, grinding the spring plates and iron work, were all valuable auxiliaries in their way, besides numerous other cases in which they had applied steam power; indeed, they would find it a serious inconvenience to be deprived of such assistance. As an illustration of this, he stated that they were now able to make a pair of carriage wheels in two hours and a half, including dressing off and bushing. After 10 years' experience, they were now about to take down their steam engine to replace it by two of much greater power. The cost of machinery was considerable, and the space required for it and the expense of fuel, would probably prevent its application with immediate advantage to the London coachmakers.*

The Noble CHAIRMAN would commence by making one or two remarks on the French Exhibition. He quite agreed with the criticisms that had been made upon the compositions of the jury, indeed he agreed so completely, that he complained very much that he had nobody to assist him with a professional opinion upon many things upon which it was impossible for a mere amateur to be thoroughly competent. He could only say he did the best he could upon the occasion of his recent duties at Paris, but he regretted to find, as it frequently happened, that the decisions had not given universal satisfaction. He thought it would ill become him to go into anything like a defence of what was done at Paris by the jurors, because

* A full account of Messrs. Holmes's Carriage Manufactory, at Derby, appeared in the *Art Journal* for 1850, page 378.—*SEC. S. OF A.*

he must naturally, with his fellow-labourers at Paris, take the responsibility of what they had there done. But in alluding to one circumstance, specially referred to by Mr. Rock, with reference to the large gold medal, he disagreed with him, as far as that was concerned, in two ways, for although he (the chairman) thought that on the one hand there was no carriage entitled to a large gold medal exhibited at Paris, he went further; he did not think it possible there could have been—for it did not enter into the category of medals the jury had to award. Supposing carriages were in the state in which they were a century ago, when any extraordinary progress could be made in the state carriage of the day, and when there was a panel, perhaps, painted by Watteau, which was frequently the case, they might then have come within the category of things entitled to a reward from the jury. He did not think that to present to the public the best manufactured article of a kind of which as good specimens had been seen for years, was a sufficient cause for the distinction alluded to. He also disagreed with Mr. Rock in reference to the posthumous fame of coach-makers, because already a great many instances had been seen in this country of very considerable posthumous fame having been attained in that profession; and what was more, he was perfectly sure that there were many men in that room who would be perfectly well known to the next generation. As to reputation, what greater reputation could a man have than a number of imitators; that was a sign of the extreme merit of the original production. He had made a memorandum while Mr. Hooper was reading his most admirable paper, in reference to the woods used in carriage-making. He had always regretted very much there was no museum, on a very large scale, of the woods of different countries; and he thought it would be one of the most interesting museums that could be added to those at present in existence in this country. It existed to a certain extent, but not on a sufficiently large and comprehensive scale. A room in the British Museum or elsewhere might be obtained, where the woods of all countries might be seen, and a beautiful collection it would be. In reference to the system of dragging, it had been justly observed that it was not quite so peculiar to France as perhaps Mr. Hooper's paper would imply. He (the chairman) thought that one great merit in that system was not touched upon—the power of gradual dragging. It seemed to him, having travelled a great deal, that it was a very considerable advantage to have the power of gradual retention of the carriage according to circumstances, and, moreover, the power of stopping it when the horses were going rather too freely with their load, or at any time. It was useless for him to add any remark upon the Paris Exhibition, because, as Mr. Hooper had gone so completely into every detail, there was nothing further to be said; and he most cordially agreed with his remarks generally. He regretted much there was not a larger display from this country, but he was perfectly aware of the truth of the reasons stated why there was not. He must say that the impression which he carried away with him from the Exhibition with reference to the carriages exhibited by French manufacturers, was that there was a great deal which was well worth the study of the trade among their neighbours. There were some things which they did better than us, which were worth looking at, and in some instances worth copying—particularly in all things relating to trimming—on the score of taste generally, on which, perhaps, he might be permitted to give an opinion more worth hearing than his opinion could be upon points of mechanism. He regretted very much to see, particularly in the French department, that which indicated very bad notions on the score of taste. To a certain extent they had seen the same thing in this country—a disposition not to consider the purpose a carriage was destined for. He was aware that he should be told by the coachmaker that that was the customer's fault, but that was not always the case, for he had very often seen carriages not built for any particular customer,

but for exhibition and sale, which were not well adapted for the purpose intended—being ornamental instead of useful. There were two or three other remarks which he would have been glad to have made, but he would conclude by moving the thanks of the meeting to Mr. Hooper for the very excellent paper which he had read, and which was one of the best and most comprehensive on the subject he had ever heard. He was sure no one present would show the least reluctance in returning the warmest thanks to Mr. Hooper for the trouble he had taken.

Mr. Hooper acknowledged the vote of thanks proposed in so gratifying a manner by his lordship, and passed so cordially by the meeting. He thanked them for the attention they had given to his remarks; it was at all times his desire to uphold and elevate the character of the manufacture in which he was engaged. He then drew the attention of the meeting to the articles on the table. The India rubber spring was a duplicate of one of those applied to a light carriage, which had been in constant (not occasional) use for three years and a half; the caoutchouc was still in excellent condition, and not one of the springs had yet been replaced. It was shown, not as a perfect application of the principle, but as being the first example of a successful application of India rubber, "on the plan of suspension," for carriage-springs. It had one advantage which steel springs had not, that the springs could be applied to carry variable weights by removing or adding to the number of the elastic rings. It was also more economical. The Guilloched panels, to represent basket work, were shown as a useful novelty in this country; he thought that being so beautiful an article, they would rapidly come into general use here, and it would repay a machinist to make a machine to supply the demand which was soon likely to arise from them. The photographs were shown as a useful manner of easily producing a perspective view of a carriage; they were not perhaps so pleasing to the eye as a well-finished design, but they had the advantage of showing all the parts as they really appear. In reply to several questions, he said he had for many years used grooved axle boxes, and had never known an axle made on that plan to stick fast, either in actual use or on conveyance by railway. The economical plan of axle shown in the French department was not alluded to as an improved plan, but merely as a cheap manner of making axles to carry oil, which required lubricating only once in two or three months, at a trifling increase of expense over the common axles made to carry grease, which required to be looked to several times a week. He was surprised Mr. Newton should refer to the endless ribbon saw shown at Paris as an improved method of sawing felloes for carriage wheels. Messrs. Holmes had for some years had a machine in use for the purpose, which sawed out the inner and outer parts correctly at one operation, the machine guiding itself with great nicety. All practical carriage-builders knew that, by boiling and steaming wood for the purpose of bending it, the wood was injured in its quality, and rendered less durable; they therefore much preferred cut timber where bending was not absolutely necessary. Mr. Conybeare's remark, that if all carriages were made to one model and of the same dimensions, they might be produced cheaper, was correct. Perhaps that gentleman was not aware that nearly all persons keeping private carriages liked to exercise their taste on them, and to have what differed in some manner from those of other persons. Mr. Conybeare remarked that many years ago a manufactory was established on a large scale for making mail coaches, all on precisely the same model, and that they were consequently made cheaper, and also that as some parts became worn out much sooner than others, the parts left sound were used for another generation of coaches. Provided the proprietor did not wish to pass off his coaches as entirely new ones, his plan was a good one, for it was well known that these coaches were rarely sold to the parties who horsed them, but were paid for at a fixed sum for every mile travelled; if, therefore, he provided sound and

safe coaches by this plan, all parties were benefitted, as the sound materials were not wasted, and the coaches could be miled at a lower rate, and the public got the benefit. For very many years large manufacturing for carriages had existed in London and the provinces, in which all the essential parts of carriages are made under the immediate inspection of the firm who make them. Unless Mr. Conybeare wished coach builders to undertake to make their cloth, tan their leather, and carry out what was generally considered to be better and more economically done by distinct trades, he did not see the force of his argument that every process should be carried on by a single firm. Although little was seen of the extent of carriage manufacture in London, it was mainly caused by their being compelled to be placed in fashionable parts of the town, near the carriage purchasers, and few liked to pay an enormous rental for frontage towards the street. The proposal to use hardened caoutchouc had not been accompanied by any information as to its price, or if it would bend perfectly true and free from puckers—if it would resist the effect of the sun's rays in hot weather—and if it would retain the paint. The suggestion of getting at the cost by looking at the price current, taking the cost of the raw caoutchouc and sulphur, mixing them together at a certain temperature, and then, by some means not explained, find the result, was like taking a piece of timber, and by sawing and chopping it long enough, you would make a carriage, overlooking the many details which must intervene. Mr. Hooper was quite aware that the friction drags were in use in Ireland, but more especially in Scotland and the north of England; his previous notice of them was more on account of their almost universal use on the continent. Mr. John Peters had somewhat misunderstood his remarks as to the reasons which he believed induced many of the large firms of London and Paris not to contribute; it was not only for want of the space, but because they were doubtful if their productions would be properly appreciated by the jury. He regretted with Lord Shelburne that at the Paris Exhibition the executive had not appointed at least one disinterested coachbuilder of high standing, either French or English, to assist his lordship in his labours. It was likely that the French members of the jury were very capable gentlemen in their own departments, but he contended that mining engineers, railway engineers, and a director of an omnibus company, were not the right persons to fairly judge of the different degrees of merit in private carriages. In reply to Lord Shelburne, he stated that he had tried white zinc paint, but had found much trouble in getting it to dry. What he had used did not retain its white colour better than lead paint, which he regretted, as he believed it was not so pernicious to health as the white lead generally used. His lordship's remark that the friction drag had the great advantage of regulating the pressure on the wheel, according to the degree of steepness of the hill to be descended, was one of its great advantages, as also that the carriage could be instantly stopped in case of a horse falling, or an accident happening to the harness. Mr. Holmes had referred to the subject of machinery for making carriages. There were, comparatively, few parts of a private carriage to which it could be economically applied; and he believed that it could not be advantageously introduced in London, where the price of coals was so high. It must be remembered that, in order to make machinery pay for its outlay, it must be kept in constant use throughout every day; if not, hand labour was the cheapest. The plan of putting on the outer wooden rim of a wheel in one bent piece, although it seemed an improvement at first sight, had several drawbacks. In order to get it on, the ends of the spokes and the bent wood itself must be excessively strained, to the injury of both parts, and the timber having to be boiled, lost its durable quality where it was of the utmost importance that it should retain it, as in the part of a wheel which is constantly exposed to the influence of water and mud. Fustic wood had been for many years

used by London coachbuilders for the stocks of wheels going to warm climates.

The Secretary announced that the Paper to be read at the meeting of Wednesday next, the 12th instant, was "On the Progress and Results of the Under-drainage of Land in Great Britain," by Mr. J. Bailey Denton. On this evening Mr. Chandos Wren Hoskyns will preside.

ECONOMIC MUSEUMS.

The Rev. Canon Moseley, who is just establishing a Trade School at Bristol, proposes to appropriate a large room in the school building as a "Special Museum for the Working Classes."

PARLIAMENTARY BLUE BOOKS.

The importance of the Institutions having ready access to the contents of these works, has formed the subject of frequent discussion at the Annual Conferences; it will therefore be interesting to them to learn that Professor Leone Levi has just issued the prospectus of a work which he proposes to publish, if he can meet with a sufficient number of subscribers to justify him in undertaking its publication. Its title is, "Annals of British Legislation; a Summary of Public Bills, Accounts, Papers, Reports of Committees and of Commissioners, and of Sessional Papers generally of the Houses of Lords and Commons, together with Accounts of Commercial Legislation, Tariffs, and Facts relating to Foreign Countries."

The work is proposed to be published in numbers, and in distinct series, distinguishing those relating to Finance, Commerce, Justice, Diplomacy, Public Health, &c., with a view to their being bound together in distinct volumes; each number to be delivered in coloured wrappers, containing one or more papers belonging to different series.

The summary of Parliamentary Papers will be published as soon as possible after their delivery. The pages of each number will vary with the extent and importance of such papers and accounts, but will consist on an average of 30 pages each; and the publication will be more frequent during the sitting of Parliament than during the recess.

The price to be at the rate of 1s. for 20 pages, and it is expected that the annual publication will not exceed 25 numbers, at a total cost to subscribers of from £2 to £3 a year.

Home Correspondence.

CYPHER WRITING.

SIR,—Doubtless the Council of the Society of Arts, as well as many other persons, who, like myself, have indulged in the fascinating art of decyphering, are continually called upon to occupy a very serious portion of their time, at the request of friends and even strangers, themselves unacquainted with that art.

Although I invariably decline such proposals, it may be of use to all parties to offer a few remarks on the subject.

To contrive a cypher which cannot be decyphered is not a question of any importance. To be really useful, the cypher must be capable of being easily and quickly written by the person using it, and as easily and quickly read by the person to whom it is addressed.

The art of decyphering resembles that of picking locks. The greater number of locks can be picked, and the only question is, what time each requires.

Mr. Hobbs, during the Exhibition of 1851, picked Bramah's challenge lock in about 56 hours.

The performers in the celebrated robbery of a bank in Scotland, spent three months in passing through three locks.

The last inscrutable cypher I decyphered, cost me thirty hours. Some have cost me four or five working days. A cypher, decyphered in Paris, for the French Government, occupied its decypherer fully during several months.

Any intelligent schoolboy can make a cypher which shall cost hours, and even days, for its solution, and it is a fact, that very clever men, who have not studied decyphering, have frequently invented cyphers which nothing (but their solution) could convince them were not inscrutable.

Under these circumstances decypherers have an understanding amongst themselves never to examine any challenge cypher unless the proposer has already proved his knowledge of the subject by having decyphered cyphers of admitted difficulty.

I am, yours faithfully,
CHARLES BABBAGE.

Dorset-street, Manchester-square, Nov. 25th, 1855.

SLAG BRICKS.

SIR,—Though much has been said about slag bricks, and there were several displays of copper and slag in their various stages, the Palais de l'Industrie has no specimens of slag moulds and slag bricks. In the South Wales districts the copper works supply slag bricks and coping stones to some extent, the smelters receiving a small fee for moulding. Some of the slag bricks are used even in the copper works. This is the case likewise in the works of the Mexican and South American Smelting Company, at Herradura, Caldera and Tongoy, in Chili, where the walls of the ore yards, and even the ash-pits and foundations of some of the furnaces are made of these materials.

Rough slag is turned to account in making embankments near some of the Welch and Lancashire Works, but it is very porous. The moles at Herradura and Caldera are filled in with rough slag, and parts of the Tongoy and Herradura works are built on what was lately shore, but now land reclaimed from the Pacific by being covered with slag.

One objection to slag bricks, which are otherwise cheap, is their brittleness.

HYDE CLARKE.

PATENTS AND THE SOCIETY OF ARTS.

SIR,—As the following paragraph, in the admirable address of the Chairman of Council to the first meeting of the Session, "During a period of our social history, when protection and monopoly were held by our most eminent statesmen and most expert statistes to be the very tap-roots of commercial prosperity and manufacturing industry, the Society of Arts discountenanced patents and monopolies of every kind," is calculated to convey a wrong impression, I beg, as an old member of the Society, to request the insertion in the *Journal* of the following statement in reference thereto:—

It was a rule of the Society of Arts, in former days, that any invention the subject of a patent could not receive any pecuniary reward, it being considered that the patent was, or ought to be, the reward selected by the inventor himself, and that the funds of the Society should be applied to the encouragement of those meritorious inventors who were prohibited by the cost of patents from securing to themselves property in the results of their own talent and ingenuity.* The inventions rewarded by the Society of Arts were to be given to, or considered the property of,

* It deserves to be recorded on every occasion, that the Society of Arts spent upwards of £100,000 in pecuniary rewards, in addition to honorary and other premiums, during the 87 years of its existence.—See Report of Select Committee, Dec. 15, 1841.

the public; and it would be a most interesting and instructive inquiry, to ascertain how many of the inventions which, during the last 50 years, may be considered as steps in the onward progress of the arts and manufactures, were the subject of patents, or so dedicated to the public by their authors.

About the year 1840 the Society was in such a state of prostration and inanition, that its winding up and dissolution was actually proposed; this was successfully resisted by various alterations and reforms, which, after six or seven years, brought the Society into a state, the foundation of its present prosperity and usefulness. The admission and exhibition of inventions, though the subject of patents, was a leading instrument in the progress of resuscitation, while the reform of the patent laws has been the subject of many committees and of much public discussion at meetings of the Society of Arts, not with the view of discouraging patents, but of making them useful for the advancement of practical science.

I remain, yours truly,
THOMAS WEBSTER.

Temple, December 5th, 1855.

NAVAL GUNNERY.

SIR,—Why should not long guns be mounted in pairs so that the recoil of one should draw out the other? See note to "Naval Essay," page 55.

M. S. BENTHAM.

FOOD AND ITS ADULTERATIONS.

SIR,—Perhaps there are few of the Institutions in Union destitute of a microscope of sufficient power to detect adulterations of food. Much good might be effected in various localities if occasional examinations of samples were made, and a list kept of the vendors. Doubtless, one or more of your readers who have studied the subject would furnish the necessary instructions through the medium of the *Journal*, should the suggestion meet your approval.

I remain, Sir,
Your obedient servant,
S. A. GOOD.

Nov. 27, 1855.

Proceedings of Institutions.

BEDFORD.—A lecture, on the "Feudal System," was given on Tuesday, the 27th November, by Mr. W. K. Norway, Esq., Secretary of the Reform Club. The origin, progress, and decline of the system were delineated in a very able and attractive manner. The chair was occupied by Mr. Coombs (hon. sec.), who, at the close of the lecture, tendered to Mr. Norway, in the names of the committee and of the audience, their best thanks for his kindness.

MACCLESFIELD.—The twentieth anniversary of the Society for Acquiring Useful Knowledge was recently celebrated by a meeting in the Town-hall. Mr. John Brocklehurst, M.P., President of the Society, occupied the chair.—The President opened the business by making a few practical observations on the working of the Society. He said that each successive year, hitherto, had been marked by considerable progress. Lately it had advanced both in point of funds and in general success. He attributed this chiefly to the growing interest taken by the working-classes in the Institution. They were awaking to the cause of education. A great deal might also be ascribed to that most useful body, the Managing Committee. Much was due to them for their devotion from year to year—to their assiduity in promoting the education of great numbers of young men, and latterly also of a large juvenile class; and last, but not least, of a

numerous female class. Of the effects of this Society he mentioned, that under its roof exists the only public news-room in the town; that it led to the development of the School of Design; and it was a gratifying fact that some of the youths instructed in that school had taken some of the highest prizes in the Exhibition at Marlborough House; and that nearly 5,000 young men had already passed through its classes. He concluded his address by speaking in terms of the highest commendation of the Honorary Secretary, Mr. D. B. Curwen, and the Secretary, Mr. Thomas Kelly.—The HONORARY SECRETARY then read the report, which stated that the number of subscribers to the Public News and Reading Room had increased to nearly 300. The voluntary and extra contributions of many of these subscribers have enabled the Committee to make permanent arrangements for the provision of telegraphic news. The library has been increased by the addition of 100 volumes by purchase, and by contributions from the President, Messrs. J. V. Novello and C. Bathurst, of London, and Mr. J. L. Thomas. The report then proceeds to state that the Educational Branch of the Institution is thriving, and that the classes are numerous and diligently attended. Gratuitous lectures were delivered by Mr. E. C. Egerton, M.P., the Rev. E. Weigall, Dr. Hudson, of Manchester, and Mr. J. Pickford. The Committee regret that, with the exception of Mr. Egerton's lecture, the attendance at these lectures was very slender. They, however, urge the resumption of lectures during the ensuing session, and state that offers have been received from the Revs. Dr. Newbold, E. Weigall, and W. B. Arthy, Messrs. E. C. Egerton, M.P., J. Burch, B. Fothergill, and J. May. Some excellent and interesting concerts were provided in the reading-room. These were numerous and attended; and the Committee offer their best thanks to Messrs. T. Chantrey, Smithers (Manchester), G. Gee, G. Gee, jun., J. Hooley, and others, for their gratuitous services on these occasions. At the suggestion of one of the honorary members (Mr. Joseph Burch), an application was made to Her Majesty's Commissioners of Patents, for a copy of the specifications and indexes published by them. It being the practice of the Commissioners to make their grants to corporate bodies only, the grant was offered to the Corporation, with permission to deposit the volumes, 350 in number, in the library of the Institution for public reference. The Mayor, on behalf of the Corporation, has accepted the grant. The receipts during the past year have been £615 1s. 10d.; the expenditure £589 7s. 1d. leaving a balance in the hands of the treasurer of £25 14s. 9d. The Committee conclude their report by remarking that as the Society emerges from its legal infancy, and enters upon its legal manhood next year, they trust a thank-offering will be made on the occasion, either to reduce the debt on the Institution premises, or to erect the proposed Lecture-hall.—Mr. E. C. EGERTON, M.P., in moving that the report be adopted, said he was one of those who thought that, though much still remained to be done, yet even now our countrymen were in point of education not inferior to the people of any other country. He believed, from a careful examination of statistical accounts, that the proportion of scholars in our different schools was at present one-eighth of the entire population of England. Mechanics' Institutes, he went on to observe, had produced the most happy and salutary fruits throughout the land. They had, in his opinion, in a great measure, supplied the want of a general system of education, in affording to thousands the means of self-instruction. The prospect of a general system of state education, to be made compulsory upon all, was unfortunately still far distant. Last Session, not less than four bills on this subject were laid on the table of the House of Commons. They were debated and discussed in the House, but not one of them passed into a law. And why? Because, although all were now agreed as to the necessity of education, few were agreed as to the means and principles by which it is to be carried out. Religious differences were the chief

obstacle. The Church of England claimed the exclusive control of religious education under the general system. To this the Dissenters objected; and so the scheme dropped. On the other hand there were those who were favourable to an exclusively secular education; but he much doubted the propriety of adopting any general scheme of secular education separated from religious instruction. For these reasons he believed that the importance of Mechanics' Institutes was daily increasing.—Mr. T. U. BROCKLEHURST seconded the motion; and in doing so remarked that to show how ignorant many people are of common necessities and articles employed in common life, he would mention what had occurred on one occasion when he was in the Great Exhibition. He was examining in the French Department some silk cocoons. While he was so engaged, a gentleman, with two elegantly-dressed ladies, came up. As they passed, he heard one of the ladies observe—"Dear me, what a curious cotton-ball! But the French are an ingenious people, to be sure." He had smiled at this; but he had thought at the same time that he might himself be equally ignorant of the raw material of other articles of everyday use. The motion was then put and carried unanimously. At the request of the President, the Honorary Secretary then proceeded to read the reports of the teachers. The *Introductory Report of the Class Committee* says that, considering the unsatisfactory state of the trade in the town, the attendance had been satisfactory, and the pupils appear to have made very creditable advancement. The teachers had also been punctual in their attendance and diligent in their duties. In the distribution of the prizes this year, it was determined that they should be awarded for attendance as well as general improvement. Although more prizes have been awarded this year than formerly, the Committee much regret that several very deserving students have been obliged to be omitted. In the *Historical and Geographical Class* (Mr. Joseph Allen, teacher,) the history of our country, and the geography of Europe, especially Britain, and those countries forming her present allies and enemy, have received careful attention. Every member of the class has furnished himself with a comprehensive text-book on each subject. In this class John Robinson, George Burton, and Isaac Moss, were recommended. In the *Reading and Dictation Class* (Mr. John Lea, teacher,) the number is not quite so great as for several years past. In the *Reading and Writing Class* (Mr. Adam Rushton, teacher,) the number of scholars is 55, the average attendance being 35. Those selected to receive prizes were, Edwin Moores, John Lyle, Levi Evans, and F. A. Whittaker. The following were commended:—James Meakin, William Mason, James Swindells, Clement Sims, John Millet, and James Gosling. In the *Stenographical Class* (Mr. William Benson, teacher,) considerable progress has been made during the past year by Isaac Moss and George Goodwin. Those commended for patient perseverance were Thomas Longden, John Batty, William Burgess, John Cundiffe, and William Walker. The first prize was awarded to James Barber, the second to William Goodwin. In the *Juvenile Class* (Messrs. M. and J. Stanway, and Jabez Barber, teachers,) the following were selected for prizes:—Joel Gorden, Samuel Goodwin, Samuel Lucas, David Salt, and Joseph Ankers. The following were commended, Henry Willott, William Browne, Adam Mottershead, Joseph Leach, Edwin Hotson and Charles Oldham. In the *Grammar Class* (Messrs. Jabez Barber and Thomas Booth, teachers,) which now consists of 50 members, the majority of whom are generally present, James Barber, William Hopkins, and John Smale were considered deserving of prizes. Much praise was also due to Frederick Whittaker, Edwin Moores, John Lyle, William Higginbotham, John Hatton, John Millet and Thomas Longden, jun. In the *Mathematical and Arithmetical Class* (Messrs. James Swindells and Thomas Johnson, teachers,) many of the pupils are far advanced in arithmetic, some in algebra, and one (George Thorneley) has passed through

both books of Molineux's arithmetic, Nicholson and Rowbotham's algebra, and is now advancing steadily through the Elements of Euclid. The number of pupils is 76, and the average attendance 53, the greater part being youths of from 16 to 20 years of age. The following were nominated for prizes:—George Thorneley, George Bradburn, Thomas Longden, Robert Bradbury, and James Bradbury. The following were commended:—Joseph Thorneley, Edwin Wain, James Barber, James Lucas, Edwin Steele, William Higginbotham, George Ryder, Frederick A. Whittaker, Edwin Moores, Thomas Lucas, John Cundiffe, and Levi Evans. In the *Female Class* (Mr. Josiah Malburn, teacher), the following were selected for rewards:—Catherine Sellars, Louisa Bradbury, Martha Genders, and Sarah Ann Wilde.—The Rev. W. R. B. ARTHY, on rising to move the next resolution, "That the thanks of the meeting be given to the officers of the Society for their valuable and unremitting services during the past year," said that what he should like to see would be this—that the child of every working man should receive a sound, thorough instruction in the elements of education in the National and other Juvenile Schools; and that then these Mechanics' Institutions should be of sufficient pretensions to follow up that instruction, and give the student an opportunity of advancing his education, and pursuing his researches as far as his abilities and opportunities would allow. After glancing at the condition of this country a century back, and remarking on the great changes which had taken place, Mr. Arthy said that he believed it was impossible to spread knowledge without doing good. They would see in all around them that it was science which secured to the people of this country all those superior advantages they now enjoyed. It was Newton who navigated our fleets, Dalton dyed our silks, Watt spun our cotton, and Liebig cultivated our soil; and though our Mechanics' Institutions might not produce a Newton or a Dalton, they might contribute to make the artisans better workmen, and improve the personal manners and domestic habits of the people. Mr. J. MAY, in seconding the resolution, observed that in his opinion sufficient allusion had not been made to the female class educated by the Society. Of all the elements which this Institution combined, he considered this was one of the best. The Rev. G. TAYLOR, Wesleyan minister, then moved that the following gentlemen be the officers of the Society during the current year:—PRESIDENT—John Brocklehurst, Esq., M.P.; VICE-PRESIDENTS—Lord Stanley of Alderley, E. C. Egerton, Esq., M.P., Thomas Brodric, Esq., S. Greg, Esq., T. R. Daintry, Esq., John Wright, Esq.; *Treasurer*—Robert Bagshaw, Esq.; *Honorary Secretary*—Mr. Curwen; *Secretary and Librarian*—Mr. Kelly; COMMITTEE—W. C. Brocklehurst, Esq., Mayor; Mr. W. Barker, Mr. R. Brodric, Mr. Thos. Bullock, Mr. B. Fawcner, Mr. W. Jeffrey, Mr. R. E. Hine, Mr. James Hooley, Mr. W. Norris, Mr. J. J. Osborne, Mr. Joseph Wright, Mr. James Birch, Mr. B. Green, Mr. R. Higson, Mr. W. Hill, Mr. Josiah Moss, Mr. B. Oldham, Mr. W. Smale, Mr. W. Steven, Mr. T. Smith, Mr. J. O. Smith; AUDITORS—Messrs. G. Bradford, G. Barton, J. Braddock. Mr. Wm. BULLOCK briefly seconded the resolution. He stated that during the past year they had added 80 honorary members to their lists. He expressed the hope that the twenty-first anniversary would be celebrated in a building capable of holding between 2000 and 3000 persons. The resolution was carried unanimously. The Rev. S. BOWEN then proposed, and Mr. JOHN WRIGHT seconded, a vote of thanks to the President, which having been carried by acclamation, was responded to briefly by Mr. BROCKLEHURST. Votes of thanks were then passed to the Worshipful the MAYOR, and Mr. D. B. CURWEN, the honorary secretary, and the proceedings terminated.

ROXTON.—Recently Mr. John Bennett, F.R.A.S., gave a very interesting lecture at the Mechanics' Institute, on "The Birth, Parentage, and Education of a Watch." The members and their friends who attended were highly

delighted, and they listened with great attention to Mr. Bennett's account of the Swiss watch manufacture, convinced that England had yet much to learn in the wise division of labour. At the conclusion of the lecture Mr. Bennett further described his excellent models and specimens of clocks and watches to those who chose to profit by his courtesy.

To Correspondents.

ERRATUM.—Page 27, col. 1, line 66, for *Hemming* read *Herring*.

MEETINGS FOR THE ENSUING WEEK.

- MON. London Institution, 7, Mr. John Ella, "On Music, Vocal and Instrumental."
Geographical, 8½, 1, Mr. James Macqueen, "Notes on the Geography of Central Africa, from the late Researches of Livingston, Monteiro, Garcia, and other Authorities;" 2, Mr. Harry Parkes, "Geographical Notes on Siam, with a New Map of the lower part of the Menam River."
- TUES. Syro-Egyptian, 7½, 1, r. Benisch, "Identification of the Tap-puach or Citron of the Feast of Tabernacles with the Ceremonial Fruit of the Assyrians;" 2, Mr. Ainsworth, "Illustration of Capt. F. Jones's Maps of Assyria." Civil Engineers, 8, Renewed Discussion of Mr. Evan Hopkins's paper "On the Gold-Bearing Rocks of the World." Med. and Chirurg., 8½. Zoological, 9.
- WED. Literary Fund, 3.
London Institution, 3, Mr. Robert Grant, "On Elementary Astronomy." Royal Soc. Literature, 4½.
Society of Arts, 8, Mr. J. Bailey Denton, "On the Progress and Results of the Under-Drainage of Land in Great Britain." Graphic, 8.
Archæological Association, 8½.
Ethnological, 8½, 1, Mr. Robert Dunn, "On the Tegumentary Differences which exist among the Races of Men;" 2, Mr. B. Beaumont, "On the Recovery of Ancient British Oral Records."
- THURS. London Institution, 7, Dr. R. E. Grant, "On the Natural History of Extinct Animals." Antiquaries, 8.
Royal, 8½.
- FRI. Astronomical, 8.
- SAT. Asiatic, 2.
London Inst., 3, Mr. T. A. Malone, "On the Elementary Principles of Vegetable and Animal Chemistry." Medical, 8.

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette November 30th, 1855.]

Dated 18th July, 1855.

1609. Théophile Louis Marie Riou, and Sylvain Guillaume Paul Dehais, Paris—Improvements in the treatment of silk.

Dated 9th October, 1855.

2252. Ellis Rowland and James Rowland, Manchester—Improvements in locomotive steam engines.

Dated 2nd November, 1855.

2447. Isham Baggs, Pentonville, and Henry Forfar Osman, 33, Essex-street, Strand—Improvements in steam engines and in engines generally which are worked either by gas, air, or vapour, and in apparatus for generating electricity, for effecting parts of said improvements, and for other purposes.
2449. Mark Osborne, Birmingham—Improvements in metallic bedsteads and other articles of metallic furniture.
2451. Robert Cook, Glasgow—Improvements in apparatus for effecting the operations of punching, rivetting, and shearing.
2453. Samuel Heeseltine, Harwich—Improvements in the means of ascertaining the depth of water in rivers, harbours, and at sea.
2455. John Jones, St. Asaph—Improvements in electric telegraphs.

Dated 3rd November, 1855.

2457. James Hegnbottom, Ovensend—Improvements in furnaces and apparatus for generating steam, whereby the smoke will be consumed and the fuel economized.

2459. James Pattison, Glasgow—Improvements in machinery for dressing and finishing woven goods and fabrics.
2461. Thomas Robert Cooper, White Mill Cottage Battersea-fields—Obtaining motion with power and velocity by purely mechanical means.
2463. James Binning, Liverpool—Improvements applicable to embossing presses.
2465. Thomas Ridgway Bridson, Bolton-le-Moors—Improvements in preparing, beetling, or finishing textile fabrics.
2467. William Prior Sharp and William Weild, Manchester—Improvements in the reeling or winding of cocoons, and in the manufacture of silk threads, and in machinery and apparatus for these purposes. (Partly a communication.)
2469. George Lloyd, Birmingham—Improvements in illumination.
2471. Richard Archibald Brooman, 166, Fleet-street—Improvements in knitting machinery. (A communication.)
Dated 5th November, 1855.
2473. Robert Spring Garden, Piccadilly—Improvements in the manufacture of hats.
2475. Arthur Dobson, Belfast—Improvements in preparing certain unbleached linen fabrics.
2477. James Nuttall, Silver-street—Improved gauntlet glove and cuffed glove.
2481. George Burridge, Great Portland-street—Improvements in the preparation of glass for ornamental purposes.
2483. George Baring Locke, Notting-hill, Kensington—Apparatus, apparatuses, or mechanism for placing detonating or fog signals on the rails of railways to be exploded thereon, and for removing the same therefrom whenever required.
2485. Alfred Vincent Newton, 66, Chancery-lane—Improved apparatus for cooling and drying flour. (A communication.)
2487. Richard Archibald Brooman, 166, Fleet-street—Improvements in fire-arms. (A communication.)
Dated 6th November, 1855.
2489. Frederic Ludewig Hahn Danchell, 4, Arthur-terrace, Caledonian-road, Islington—Improvements in apparatus for ascertaining the pressure of steam, air, water, or any other fluid or liquid.
2491. Joseph Schloss, Wellington-chambers, Cannon-street West—A new mounting for travelling-bags.
2493. Samuel Cunliffe Lister, Manningham, near Bradford—Improvements in weaving pile fabrics.
Dated 7th November, 1855.
2497. Charles Hanson, Pimlico—Improvements in fire-arms.
2499. Joseph Hale, Manchester—Improvements in the buffers and spring draw-bars of waggons or other railway vehicles, and in the application of the same.
2501. William Grindley Craig, Gorton, near Manchester—Improvements in bearing, buffing, and draw-springs, applicable to the rolling stock of railways and other vehicles.
2502. William Kenworthy, Blackburn—Improvements in steam engine valves, and in the mode of working the same.
2503. William Davis, Northampton-place, Old Kent road—Improvements in the construction and arrangement of furnaces and furnace bars for the better combustion of smoke and prevention of loss of heat by radiation.
2505. William Johnson, 47, Lincoln's-inn-fields—Improvements in the manufacture and application of prussiates and other colouring matters. (A communication.)
2507. William Dray, Swan-lane—Improvements in apparatus for heating, baking, and drying.
2509. William Lund, Fleet-street, and Alexander Bain, Paddington—Improvements in pencil-cases.
2511. Charles Allen Browne, Massachusetts, U.S.—A machine for manufacturing bricks. (A communication.)
2513. George Tomlinson Bousfield, Sussex-place, Loughborough-road, Brixton—Improvements in wrought-iron shafts for steam-boats and other purposes where a great strength is required. (A communication.)
2515. Thomas Burgin, Great Winchester-street—Improved construction of ledger hand rest.
Dated 18th November, 1855.
2517. Charles Page, Ware—Improved construction of railway signal apparatus.
Dated 9th November, 1855.
2521. John Raywood, Wentworth, Yorkshire—Improved rolling, dribbling, sowing, and harrowing machine for wheat and other agricultural produce.
2523. Henry Fletcher, Manchester—Improvements in the manufacture of nuts, bolts, and other similar articles, and in machinery or apparatus for making the same.
2525. William Henry Walenn, 46, Regent-street—Improvements in looms for weaving seamless bags and other open double fabrics of a similar character. (A communication.)
2527. Thomas Pritchard, Walsall—Improvements in manufacturing welded iron tubes.
Dated 10th November, 1855.
2529. William Henry Bentley, Bedford—Improved cannon, guns, and other fire-arms, and appendages thereto, and in the cap-sules, cartridges, and projectiles for the same and other fire-arms.
2531. Louis Eekell, 22, Cockspur-street, Pall Mall—A new enamel for filling or stopping decayed teeth.
Dated 14th November, 1855.
2566. Cyprien Marie Tessié du Motay, Paris—Improvements in the treatment of fatty and oily matters.
Dated 16th November, 1855.
2582. Charles Crum and Charles Paul, Hudson, Columbia, New York—Process for making bread.
2586. Thomas Hudson, Warrington—Improvements in machinery or apparatus for cutting and punching metals, paper, leather, and similar articles.
2588. James Hinks and Frederick Dowler, Birmingham—Improved machinery for the manufacture of percussion caps, and for cutting out and raising articles in metal generally.
Dated 17th November, 1855.
2592. John Hosking, Gateshead Iron Works—Improvements in vertical direct action marine engines.
2594. Henry Ball, Great Russell-street, Birmingham—Improvement in gun-sights.
2598. George Collier, Halifax, and James William Crossley, Brighouse—Improvements in finishing fabrics and in treating yarns, part of which improvements is also applicable to producing ornamental effects upon other surfaces.
Dated 19th November, 1855.
2600. John Fleetwood, Elm Grove House, Southsea—Improved portable apparatus for making malt, and for drying hops, corn, and other grains and seeds.
2602. William Smith, 10, Salisbury-street, Adelphi—Improvements in gas regulators. (A communication.)
2604. Richard Archibald Brooman, 166, Fleet-street—Improvements in apparatus for measuring liquids, which may also be employed as a motive power engine. (A communication.)
2606. Jeanne Barbe Ve. Lopez, 57, Rue de Bretagne, Paris—An anti-bilious powder.
2608. William Henry Preece, 7, Bernard street, Primrose-hill—Improvements in electric telegraphs.

INVENTION WITH COMPLETE SPECIFICATION FILED.

2623. Alexandre Tolhausen, 7, Duke-street, Adelphi—Making metallic chains. (A communication.)—21st November, 1855.

WEEKLY LIST OF PATENTS SEALED.

Sealed November 30th, 1855.

1254. Charles Isidore Constant Venant.
1257. Henry Spencer.
1258. John Boyd.
1259. John Lane and John Taylor.
1262. Charles Little.
1276. Francis Puls.
1287. Alexander Morton and Edmund Hunt.
1288. John Gedge.
1378. Isidore Carlihan and Isidore Corbier.
1433. Simon Eugene Gabriel Simon.
1434. Stephen White.
1460. John Page.
1486. Joseph Eccles.
1590. William Henry Tayler.
1770. Arthur Warner.
2212. Henry Oldham.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.
November 26th.

1103. Edward Schischkar.
November 27th.
1180. William Busfield.
November 28th.
918. Joseph Skerthley, junior.
930. John Dable and William Wells.
1001. Anthony Norris Groves and Conrad William Finzel.
1152. Fulcran Peyre and Michel Dolques.
November 29th.

924. William Slater,
935. James Edward McConnell.
936. John Norton.
1068. Anthony Norris Groves.
November 30th.
964. Isaac Lewis Pulvermacher.
1146. Nicolas Malinau.
December 1st.
944. Page Dewing Woodcock.
949. John Bethell.
958. Alexander Lawrie.
961. Joseph Cliff.
962. William Maugham.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3791	December 5.	Wind Guard and Ventilator	Gideon Gledhill	Lindley, near Huddersfield.